

JOINT UNMANNED GROUND VEHICLES

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Introduction

Both the Army, in its vision of transformation, and the Marine Corps, to some extent through the Navy's Future Naval Capability (FNC), are undergoing revolutionary changes in how their forces will be equipped to fight in the future. Both Services envision future forces to be heavily dependent on robotic technologies. Congress has also expressed its belief that unmanned systems will be an important element of our future force. The FY01 Appropriations Bill acknowledges this role by stating that "a goal of the Armed Forces is to achieve the fielding of unmanned, remotely controlled technology such that by 2015, one-third of the operational ground combat vehicles will be unmanned." Today, these systems are being developed and fielded by the Unmanned Ground Vehicles/Systems Joint Project Office (UGV/S JPO), Redstone Arsenal, AL.

Background

During the late 1980s, the Services began showing interest in outfitting their forces with a variety of robotic applications to assist in missions that included reconnaissance, surveillance, and target acquisition (RSTA); logistics;

minefield detection and neutralization; obstacle breaching; explosive ordnance disposal; physical security; and operations in contaminated environments. In 1989, DOD, the Army, and the Marine Corps consolidated their separate efforts to develop battlefield ground robotic systems and established the UGV/S JPO under the Office of the Secretary of Defense-managed Joint Robotics Program.

The Tactical Unmanned Ground Vehicle (TUGV) Program was the JPO's first program and served as the core robotics program. The TUGV Program was a joint Army and Marine Corps effort to develop, produce, and procure unmanned RSTA systems. This effort included extensive user and project trials with surrogate UGVs to assess operational benefits and liabilities and assist in refining requirements. Several of today's UGV/S JPO programs were developed with the same concepts and by leveraging technologies from this core program. Although unforeseen at the time, this early work provided the foundation for what later became a vision for future forces, including a significant capability in unmanned systems.

The Army is undergoing a radical transformation with an end state of a

more responsive, deployable, agile, versatile, lethal, survivable, and sustainable force that is capable of responding to missions across the full spectrum of conflict. Robotics will be a key and critical element to achieve transformation objectives. The Army took the first step in its transformation by initializing two interim brigade combat teams (IBCTs) at Fort Lewis, WA. These brigades are equipped with off-the-shelf equipment to evaluate and refine the operational and organizational (O&O) plan.

Robotics will be part of the IBCT. This unmanned capability isn't mature enough to meet requirements of the objective force, but continues to progress. Validation of the O&O plan and systems concepts and requirements necessary to develop the Army's future force will help shape the evolution of robotics of the future.

Army Transformation Strategy

The common thread in key technology developments for the objective force is the Future Combat Systems (FCS). The Army and the Defense Advanced Research Projects Agency are leading the FCS Program to create a family of systems that is lethal, mobile, and survivable. While emphasis is on the design of the "lightweight" vehicle

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family, FCS will provide a common baseline capability with robotics in the forefront.

The FCS Program is pushing the technology envelope to make robotics work in the operational environments necessary to support the objective force. Technologies such as non-line-of-sight communications, intelligent mobility, tactical behaviors, and artificial intelligence are essential for unmanned operations and FCS to succeed.

Navy FNC

Coinciding with the Army transformation is the Navy's FNC, which was established in 1999 by the Department of the Navy (DON) Science and Technology (S&T) Board. The FNC effort will help prioritize applied S&T investments to improve naval capabilities. The DON S&T Board approved 12 FNCs representing the Navy's highest priorities to support future operational forces. The FNC mission is to identify those mature and evolving technologies that, through focused investment, guidance, and management, can provide near-term enabling capabilities for the warfighter.

The Autonomous Operations FNC addresses those critical technologies that would promote the Marine Corps' use of UGVs in an expeditionary warfare campaign. The UGV S&T investment will focus on accelerated development of technologies to fill critical capability gaps; will demonstrate those technologies with operational forces—gaining customer feedback prior to transition; and will transition robotics technologies into acquisition programs. The UGV Autonomous Operations FNC Program is scheduled for execution from FY02 to FY07.

Specifically, the UGV technology product line will focus on technologies that address capability gaps in robotic mobility, survivability, durability, modular sensors, navigation, and communications. Demonstrations will focus on using UGVs to enhance the ability of tactical commanders to rapidly detect, identify, and remotely neutralize a variety of threats. The program's

primary transition target is engineering and manufacturing development (EMD) for the Marine Corps' Gladiator system and for emerging concepts for small, autonomous UGVs under the mini/micro RSTA UGV effort.

Current And Future Uses

Unmanned systems are being used by our forces today, albeit in very limited numbers and for very specific missions, such as mine proofing and explosive ordnance disposal. As such, these missions have laid a foundation for the introduction of other mission capabilities. As robotic technologies have matured during the past decade, prototype systems were provided to soldiers and Marines in the field. Some of these systems are used today by our forces in Kosovo, Bosnia, and Germany, while others are in the various stages of further development. The JPO continues to develop and field these systems for use on the battlefields of tomorrow.

Standardized Robotic System (SRS)

Another important effort is the SRS, which is the core of the Panther vehicle teleoperation (VT). Panther is a turretless M-60 tank that pushes track-width mine-proofing rollers. The SRS is a kit that provides teleoperation capa-

bility to a variety of existing military vehicles. The SRS is a highly accelerated effort currently in EMD. Early version SRS kits are deployed with our land forces in Kosovo, Bosnia, and Germany—a significantly expanded use of robotics by U.S. forces in the field.

The SRS is being developed using a family of common components or line replaceable units that can be applied on many different platforms with minimal new development efforts. The SRS is transparent to the vehicle operator while the vehicle is being operated manually. These kits are being hardened for use in standard military environments.

Man-Portable Robotic Systems (MPRS)

The MPRS Program provides lightweight man-portable UGVs to support the missions of light forces and special operations units. Current program focus is on reconnaissance during Military Operations in Urban Terrain (MOUT). However, concept exploration for man-portable systems is on the fast track for both maneuver and maneuver-support missions. Exploring different concepts, the JPO recently supported a very successful concept experimentation program (CEP) at the Maneuver Support Center, Fort



Panther in operation



MPRS during CEP

Leonard Wood, MO, for both engineer tunnel and sewer reconnaissance and military police missions.

Robotic Combat Support System (RCSS)

The RCSS recently completed Milestone I, and a Request for Proposal was issued. The objective of the RCSS effort is to develop and deliver systems to perform multiple engineer missions, including anti-personnel landmine neutralization, emplacement of ordnance and munitions, smoke obscuration dispensing, wire obstacle breaching, and logistics transport. Future system upgrades will be added through preplanned product improvements.

A design objective is to develop the RCSS mission-module interface to enable snap-on and -off mission modules. Maximum use will be made of commercial-off-the-shelf hardware and software in achieving the objective. The RCSS will replace miniflails, which, for the last 10 years, have been involved in contingency asset mine-proofing operations in Southwest Asia, Bosnia, and Kosovo.

Gladiator

Gladiator is a Marine Corps effort to fulfill requirements for an unmanned systems capability to meet its most dangerous missions, from Operational Maneuver From The Sea to military operations on urbanized terrain

MOUT. The Gladiator system will allow organic unmanned scout/surveillance operation with a day/night capability, and have "plug-and-play" adaptability to change mission modules—not only for RSTA, but also for lethal and non-lethal weapon systems and nuclear, biological, and chemical surveillance. Gladiator is in the Concept and Technology Development phase, with concept validation models being developed. Follow-on efforts to develop mini/micro RSTA UGV capability to meet emerging concepts for small, autonomous UGVs will continue as the technologies mature.

DEMO III

The DEMO III Experimental Unmanned Vehicle (XUV) Program, an Army Research Laboratory Advanced Technology effort, is designed to provide significant technology development for future unmanned systems. New and evolving autonomous vehicle technology that emphasizes perception, navigation, intelligent systems architecture, and mission planning is being developed. Technology developed in the DEMO III Program will serve as the catalyst for future system capabilities and programs.

Conclusion

Developing and fielding effective UGVs that lessen the dangers our soldiers and Marines are exposed to is an awesome and challenging task. The Unmanned Ground Vehicles/Systems Joint Project Office is one of several organizations involved in meeting this joint challenge. These systems have already proven their value for our soldiers and Marines in the field, and their application supporting future operations is both widespread and unlimited.

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